Guru Gobind Singh Public School

Holiday Home Work

Physics

Class XII

Objective Type Questions

1. Why charges do resides outer surface of the charged conductor?
2. Write the formula of electric dielectric constant in terms of Coulomb's force.
3. Differentiate between charging by induction and charging by conduction.
4. How does electric field vary with distance for a point charge as well as dipole?
5. What is the ratio of electrostatic force and gravitational force between two protons?
6. Why it is difficult to perform electrostatic experiments during humid days?
7. Why can we ignore quantization of electric charge when dealing with macroscopic charges?
8. What are the necessary conditions of Gaussian surface?
9. Draw a graph showing the variation of electric field with distance for uniformly charged metallic sphere.
10. Write the expression of Colombian force using linear density of charges(λ).
11. What is the value of net force when an electric dipole rotating in non uniform electric field?
12. Write the formula of potential energy for an electric dipole plaed in uniform electric field.
13. Why electric field lines are continuous and open loops?
14. What will be value of work done when a dipole rotates from 0° to 180° in uniform electric field(E)?
15. If electric lines of flux are inward towards a enclosed surface, then the nature of charge is ?
16. What are the necessary conditions of Coulomb's forces considering intervening medium also?
17. Write the formula of electric field due to a point charges in rectangular form.
18. State superposition principle, how it can be used for multiple charges?
19. What is a couple for a dipole moment? Write the value of net force of it.
20. Is repulsion is the sure test of electrification? How?

Short Answer Type Questions:

21. Express Coulomb's law in vector form. Show that Coulomb's forces are follow action reaction pair using two point charges.
22. State Gauss' law of electrostatics. Using Gauss 'law prove Coulomb's law .
23. Write any five features of electric lines of forces.
24. Apply Gauss' law to find electric field for (i) infinitely uniform charged wire (ii) infinitely uniform charged sheet,
25. Define electric flux. Write its SI unit. What will be the value of electric flux of an enclosed dipole?
26. With proper diagram show stable and unstable equilibrium of an electric dipole.
27. Establish the relation between electric field and electric potential due to a point charge.
28. What is the significance of electric field? Explain with proper reason.

29. What is the nature of symmetry of a dipole field. A force experienced by a point charge on the axis of a dipole is F. What will be the force experienced by the point charge if its distance is doubled from the dipole?
30. (i) Why two electric lines of forces does not intersect each other?
    (ii) Define electric dipole . Write its unit and dimension.

Long Answer Type

31. Derive the expression of electric field due to a short electric dipole at any point in space. Also derive the axial and equatorial electric field using necessary conditions.
32. Derive an expression for the electric field at a point along
    (a). the axial position of an electric dipole.
    (b). on the equatorial position of an electric dipole.
33. Derive a mathematical expression for the torque on an electric dipole in a uniform electric field.
34. Derive a mathematical expression for the potential energy on an electric dipole in a uniform electric field.
35. Find the electric field of a metallic shell or solid conducting sphere along (i) inside (ii) on the surface (iii) outside the sphere with a graph between electric field and the distance.

Numerical:

36. Force between two points electric charges kept at a distance d apart in air is F. If these charges are kept at the same distance in water, how does the force between them change?

37. Two point charges 10μC and 20μC are separated by a distance r in air. If an additional charge of -8μC is given to each, by what factor does the force between the charges change?
38. Two extremely small charged copper spheres have their centres separated by a distance of 50cm in vacuum. (a) What is the mutual force of electrostatic repulsion if the charge on each is 6.5×10^{-7} C? (b) What will the force of repulsion if (I) the charge on each sphere is doubled and their separation is halved (ii) Two spheres are placed in water (dielectric constant of water is 80)?
39. Calculate the Coulomb force between a proton and an electron separated by a distance of 0.8×10^{-15}m.
40. Two point charges Q are kept at a distance r from each other. A third charge q is placeon the line joining the above two charges such that all the three charges are in equilibrium, What is the magnitude, sign and the position of the charge q?
41. A charge q is placed at the centre of the line joining two equal charges Q and Q. Calculate the value of charge q such that all the three charges are in equilibrium. Also mention the nature of this charge.
42. Two point charges of charge values Q and q are placed at a distance of x and x/2 respectively from a third charge of charge value 4q, all charges being in the same straight line. Calculate the magnitude and nature of charge Q such that the net force experienced by the q charge is zero.
43. Two point electric charges of values q and 2q are kept at a distance d apart from each other in air. A third charge Q is to be kept along the same line in such a way that the net force on q and 2q is zero. Calculate the position of the charge Q in terms of q and d.
44. Force of attraction between two point charges placed at a distance ‘d’ apart in a medium is ‘F’. What should be the distance in the same medium so that the force of attraction between them becomes 9F?
45. Two similarly and equally charged identical metal spheres A and B repel each other with a force of 2×10^{-5} N. A third identical uncharged sphere C is touched with A and then placed at

the mid point between A and B. Calculate the net electric force on C.

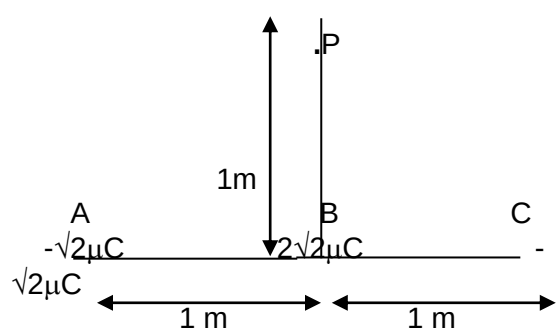
46. Two identical metallic spheres, having unequal, opposite charges are placed at a distance of 0.90 m in air. After bringing them in contact with each other, they were again placed at the same distance apart . Now the force of repulsion between them is 0.025 N. Calculate the final charge on each of them.
47. Four point charges of q_a = 2 μC, q_b = - 5 μC, q_c = 2 μC and q_d = -5 μC are located at the corners of a square abcd of side 10 cm. Find the force on a charge 1 μC placed at the center O of the square.
48. Two equal charges of + 2 x 10^{-16}C are placed 20 cm apart in air. At a point midway between them find the force acting on a charge of +2x10^{-16}C.
49. A charge q is placed at the center of the line joining two equal charges Q. Show that the system of three charges will be in equilibrium if q = – Q/4.
50. Define electric field intensity at a point. An electron moves a distance of 6cm when accelerated from rest by an electric field of strength 2x10^4N/c. Calculate the time of travel.

51. Two point charges q1 = +0.2C and q2 = + 0.4C are placed 0.1m apart. Calculate the electric field at mid point between the charges.

52. Two point charges of + 3 x 10^{-19}C and +12x10^{-19}C are separated by distance of 2.5m. Find the point on the line joining them at which the electric field intensity is zero.
53. Two point charges q_A = +3μC and q_B = -3μC are located 20 cm apart in vacuum. Ii) Find the electric field at the mid point of the line AB joining the two charges. (ii) If a negative test charge of magnitude 1.5 x 10^{-9} C is placed at the center, find the force experienced by the test charge.

54. Two equal charges of + 2 x 10^{-16}C are placed 20 cm apart in air. At a point midway between them find the force acting on a charge of +2x10^{-16}C.
55. Two charges of magnitude +25 nC and –9 nC are located at points A(1,2) and B(5,2) respectively. Find the magnitude of electric field due to these charges at the point C(5,5). All the distances are measured in meters.

56. Three charges -√2μC, 2√2μC and -√2μC are arranged along a straight line as shown in the figure. Calculate the total electric field intensity due to all these three charges at the point P.



57. Two point charges q_A = + 3μ C and q_B = – 3 μC are located 20 cm apart in vacuum. Find the electric field at the midpoint of the line AB joining the two charges. If a negative charge of magnitude 1.5x10^{-9} C is placed at the center, find the force experienced by the test charge.

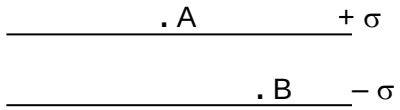
58. An electric dipole, when held at 30° with respect to a uniform electric field of 10^4N/C, experiences a torque of 9x10^{-26}N-m. Calculate the dipole moment of the dipole.
59. An electric dipole of length 2 cm is placed with its axis making an angle 60° to a uniform electric field of 10^5 N/C. If it experiences a torque of 8x$3^{1/2}$ Nm, calculate the (I) magnitude of

the charge on the dipole and (ii) potential energy of the dipole.

60. Two point charges $q_1 = 5.4 \times 10^{-6}$ C and $q_2 = -5.4 \times 10^{-6}$ C are located at the points A (0, -5) and B (0, +5) respectively in X-Y plane, the distance being measured is meters. Draw a schematic diagram and calculate the electric dipole moment of this charge system. Mark one point each in the diagram where the electric field of this charge system is (i) parallel to its dipole moment and (ii) anti-parallel to its dipole moment.

61. An electric dipole of length 4 cm, when placed with the axis making an angle of 60° with a uniform electric field experiences a torque of $4\sqrt{3}$ Nm. Calculate the (I) magnitude of the electric field, (ii) potential energy of the dipole, if the dipole has the charges of $\pm$ 8 nC.

62. Two plane sheets of charge densities
    a. $+\sigma$ and $-\sigma$ are kept in air as shown
    b. in the figure. What is the electric field
    c. intensities at points A and B?

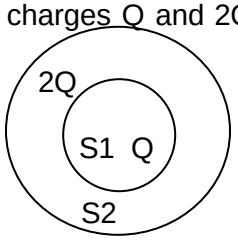


63. A point charge causes an electric flux of -1.0×10^3 Nm2/C to pass through a spherical Gaussian surface of 10.0 cm radius centered on the charge. (a) If the radius is doubled, how much flux would pass through the surface? (b) What is the value of the point charge?

64. An electric flux of -6×10^3 Nm^2/C passes normally through a spherical surface of radius 10 cm, due to a point charge placed at the centre. (i) What is the charge enclosed by the Gaussian surface? (ii) If the radius of the sphere is doubled,, how much flux would pass through the surface?

65. S_1 and S_2 are two hollow concentric spheres enclosing charges Q and 2Q as shown in the figure. (i) What is the ratio of the electric flux through S_1 andS2.

    (ii) How will the electric flux through sphere S_1 change, if a medium of dielectric constant 5 is introduced in the space inside S_1 in place of air?



66. State Gauss' Theorem of Electrostatics. A charge of 17.7×10^{-4} C is distributed uniformly over a large sheet of area 200 m^2. Calculate the electric field intensity at a distance of 20 cm from the sheet in air.